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ABSTRACT OF THE DISCLOSURE

A piezoelectric/electrostrictive film element formed at low temperature using electrophoretic deposition by method which includes the steps of: dissolving or dispersing the raw material of constituent ceramic elements in a solvent or a dispersion medium; adding citric acid into the solution or the dispersed mixture; obtaining ultrafine ceramic oxide powder of particle size less than 1  $\mu\text{m}$  with uniform particle diameter size distribution by forming ceramic oxide by a nonexplosive oxidative-reductive combustion reaction by thermally treating the mixed solution at 100-500°C; preparing a suspension by dispersing the ultrafine ceramic oxide powder in an organic dispersant; preparing ceramic sol solution by dissolving constituent ceramic elements of the same or similar constituent as the ultrafine ceramic oxide powder in water or an organic solvent; mixing the suspension with the ceramic sol solution; forming a piezoelectric/electrostrictive film element by submerging a substrate into this mixture and then by performing electrophoretic deposition; and thermally treating the piezoelectric/electrostrictive film element at 100-600°C.

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Docket No.: 2598/1G196US1

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of: Sang Kyeong YUN ET AL.

Filed: Concurrently

For: PIEZOELECTRIC/ELECTROSPTRICTIVE FILM ELEMENT AT LOW TEMPERA-  
TURE USING ELECTROPHORETIC DEPOSITION

MARKED-UP SPECIFICATION

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~~METHOD FOR FORMING PIEZOELECTRIC/ELECTROSTRICTIVE FILM ELEMENT~~  
~~FORMED~~  
~~AT LOW TEMPERATURE USING ELECTROPHORETIC DEPOSITION AND THE~~  
~~FILM ELEMENT FORMED BY THE METHOD~~

5 BACKGROUND OF THE INVENTION

Field of the Invention

The present invention relates to a ~~method for forming~~  
piezoelectric/electrostrictive film element <sup>formed by a method</sup> using an ultrafine  
ceramic oxide powder and the electrophoretic deposition, and  
piezoelectric/electrostrictive film element produced by the  
method. In particular, the present invention relates to a  
~~method for forming a piezoelectric/electrostrictive film element~~  
<sup>formed</sup> at low temperature by way of electrophoretic deposition ~~method~~  
using an ultrafine ceramic oxide powder having excellent  
reactivity and produced by a single process at low temperature,  
~~and the piezoelectric/electrostrictive film element produced by~~  
~~the method.~~

Description of the Prior Art

Unit particle micronization and <sup>uniformity of</sup> particle diameter  
distribution ~~uniformization~~ etc. are emphasized in ceramic  
oxide powder which is <sup>a</sup> raw material of various devices. Using the  
ceramics such as ink jet head, memory chip, and piezoelectric  
substance, <sup>This is</sup> because in case of finer particles the activation  
energy can be lowered by surface treatment and the reactivity  
and applicability can be improved by particle electrification.

So far the method has been used where a ceramic sol <sup>with</sup>  
controlled ~~of~~ viscosity or a ceramic oxide powder regenerated by  
a suitable solvent is fixed at the substrate in order to form a